National Institute of Environmental Health Sciences

Fostering resilience to extreme events within infrastructure systems: Characterizing decision contexts for mitigation and adaptation

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Abstract:

Resilience of complex systems has emerged as a fundamental concern for system managers, users, and researchers. This paper addresses resilience within infrastructure systems, after an extreme event such as an earthquake. It develops a conceptual framework for understanding the factors that influence the resilience of infrastructure systems in terms of two dimensions: robustness (the extent of system function that is maintained) and rapidity (the time required to return to full system operations and productivity). The paper also characterizes a framework through the use of flow diagrams for understanding kinds of decisions that can be pursued within infrastructure systems to foster these two dimensions of system resilience. It uses the results of several data-gathering efforts, including preparation of a database on infrastructure interactions, interviews with hospital emergency managers, and interviews with other kinds of infrastructure system operators. The paper then applies this framework to the example of planning for system resilience within individual hospitals in the context of earthquake mitigation efforts. The results indicate that common decision contexts (both ex-ante and ex-post) arise across many different infrastructure contexts when considering ways to make infrastructure systems more resilient. The detailed discussion of hospitals points to the importance of learning from experience in previous disasters, of managing the availability of the facility's staff in a disaster, of daily communication among the staff to ensure high utilization of the available hospital capacity, and of flexibility in ways of addressing specific system failures such as water. The results also point to several ways in which the flow diagrams can be used for ongoing planning and implementation to enhance infrastructure system resilience.

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Resource Description

Communication:

resource focus on research or methods on how to communicate or frame issues on climate change; surveys of attitudes, knowledge, beliefs about climate change

A focus of content

Other Communication Audience: Hospital administrators

Exposure :

weather or climate related pathway by which climate change affects health

Extreme Weather Event

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

Global or Unspecified

Health Impact:

specification of health effect or disease related to climate change exposure

General Health Impact

Medical Community Engagement:

resource focus on how the medical community discusses or acts to address health impacts of climate change

A focus of content

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Resource Type:

format or standard characteristic of resource

Research Article, Review

Resilience:

capacity of an individual, community, or institution to dynamically and effectively respond or adapt to shifting climate impact circumstances while continuing to function

A focus of content

Timescale:

time period studied

Time Scale Unspecified